1270

CORRES. CONTROL
OUTGOING LTR NO.

DOE ORDER # _____
93 RF 10129

DIST.	LTR	ENC
AMARAL, M.E.		
BENEDETTI, R.L.		
BENJAMIN, A.		
BERMAN, H.S.		
BRANCH, D.B.		
CARNIVAL, G.J.		
COPP, R.D.		
DAVIS, J.G.		
FERRERA, D.W.		
HANNI, B.J.		
HARMAN, L. K.		
HEALY, T.J.		
HEDAHL, T.		
HILBIG, J.G.		
KIRBY, W.A.		
KUESTER, A.W.		
MANN, H.P.	✓	
MARX, G.E.		
McDONALD, M.M.		
McKENNA, F.G.		
MONTROSE, J.K.		
MORGAN, R.V.		
POTTER, G.L.		
PIZZUTO, V.M.		
RILEY, J.H.		
RISING, T.L.		
SANDLIN, N.B.		
SETLOCK, G.H.		
STEWART, D.L.		
SULLIVAN, M.T.		
SWANSON, E.R.		
WILKINSON, R.B.	✓	
WILLIAMS, S. (ORC)		
WILSON, J. M.		
WYANT, R.B.		
Primrose, A	✓	✓
Dillie, E.	✓	
Busby, W	✓	
Lake, D.	✓	
CORRES CONTROL	X	X
ADMIN RECORD (2)	✓	
PATS/T130G		
TRAFFIC		

CLASSIFICATION:

UCNI		
UNCLASSIFIED		
CONFIDENTIAL		
SECRET		

AUTHORIZED CLASSIFIER SIGNATURE

~~DOCUMENT CLASSIFICATION REVIEW WAIVER PER~~
DOCUMENT CLASSIFICATION OFFICE

IN REPLY TO RFP CC NO:

ACTION ITEM STATUS
☐ PARTIAL/OPEN NA
☐ CLOSED

LTR APPROVALS
WSB:WP

ORIG. & TYPIST INITIALS
ALP dql

RF-46469 (Rev. 7/93)

EG&G ROCKY FLATS

EG&G ROCKY FLATS, INC.
ROCKY FLATS PLANT, P.O. BOX 464, GOLDEN, COLORADO 80402-0464 • (303) 966-7000

August 17, 1993 93-RF-10129

Richard J. Schassburger
Acting Director
Environmental Restoration Division
DOE, RFO

Attn: S. R. Grace

TRANSMITTAL OF THE REVISED PAGES FOR TECHNICAL MEMORANDUM NO. 8 (TM 8), BEDROCK WORK PLAN - WSB-330-93

EG&G Rocky Flats, Inc. is transmitting five (5) copies of the above referenced pages to the Department of Energy, Rocky Flats Office. These pages were written in response to concerns from the regulatory agencies about the wording in TM 8.

If you have any comments concerning this matter, please contact A. L. Primrose of my staff at extension 8618.

W. S. Busby
Acting Director
ERM/Remediation Project Management

ALP:dql

Orig. and 1 cc - R. J. Schassburger

Enclosures:
As Stated

U M

REVIEWED FOR CLASSIFICATION/UCNI
BY G. T. Cotsick
DATE 8-25-93

This technical memorandum presents the Revised Phase II Resource Conservation and Recovery Act (RCRA) Facility Investigation/Remedial Investigation (RFI/RI) Work Plan (Bedrock) for the Rocky Flats Plant (RFP) Operable Unit No. 2 (OU-2). This work plan, hereafter referred to as the Revised Bedrock Work Plan, refines and reduces the scope of work for investigation of the Lower Hydrostratigraphic Unit (LHSU) that was presented previously in the Phase II RFI/RI Work Plan (Bedrock) (EG&G 1991e), hereafter referred to as the Bedrock Work Plan. This reduction in scope is appropriate based on a review of data previously collected and currently being compiled as part of the implementation of the Phase II RFI/RI Work Plan (Alluvial) (EG&G 1991b). The existing OU-2 data indicate that the LHSU sandstones are discontinuous with low permeability and that substantial contamination is not present.

The Revised Bedrock Work Plan focuses on acquiring data to verify that contamination in the LHSU is limited in extent. The field investigation program is a focused program designed to incorporate an observational approach that will allow the field results to be evaluated as each field component is completed. With this approach, the investigation of the LHSU can be expedited, while reducing the potential need for additional phases of field investigation. Figure ES-1 illustrates the decision process for using field results, as they are obtained, to evaluate the LHSU. If groundwater samples cannot be collected from the LHSU or analytical results indicate that contaminants are not present at detectable levels this will confirm the limited extent of contamination in the LHSU. As such, the LHSU will be considered an incomplete pathway and a quantitative assessment of the human health risks associated with a LHSU exposure pathway will not be conducted.

The Revised Bedrock Work Plan will be implemented simultaneously with ongoing alluvial site characterization and risk assessment work in order to complete the Phase II RFI/RI Report in the spring of 1994, because of the expected condition that contamination in the LHSU has limited extent. It is expected that the results of the Revised Bedrock Work Plan will support that assumption. The results of the expedited analysis of the indicator parameters for groundwater will be used to evaluate if the expected condition of limited extent of contamination in the LHSU is met. The validated analytical results from the Revised Bedrock Work Plan will not be available for inclusion in the Draft Phase II RFI/RI Report. However, all available results of the expedited

indicator parameter analysis, as well as available non-validated analytical results for full suites of LHSU analytical parameters will be included in the data section of the Draft Phase II RFI/RI Report.

If the expected condition is found not to exist, delays in the currently identified schedule for submittal of the Draft and Final Phase II RFI/RI Reports may result. To minimize potential delays, a contingency plan is being developed so that, if the results of the Revised Bedrock Work Plan do not confirm the assumed site conditions, this plan can be implemented while the field crews are mobilized. The contingency plan will be reviewed and approved by EPA/CDH.

The Data Quality Objectives (DQO) process was utilized in developing this technical memorandum. The DQO process is an iterative process designed to focus on decision making and project objectives to ensure that data acquisition activities are logical and cost effective.

Previous field investigations (Phase I and Phase II) conducted at OU-2 have addressed the geologic characterization of the alluvial and bedrock deposits, associated groundwater flow systems, and sources and extent of chemical and radiological contamination. Data for the Upper Hydrostratigraphic Unit (UHSU) and LHSU at RFP were reviewed and utilized in developing this technical memorandum. Substantially more data are available for the UHSU than LHSU because most of the subsurface data collection activities conducted to date have focused on characterizing the UHSU. However, data from 30 existing LHSU wells and 11 borings are available. Based on a review of those data, it appears that potential sources of contamination to LHSU sandstones are limited to secondary groundwater plume sources within the UHSU.

To evaluate potential UHSU plume sources, alluvial/colluvial and No. 1 Sandstone isoconcentration maps for carbon tetrachloride (CCl_4) were prepared (Figures 1-25 and 1-26) to identify UHSU contamination hotspots. Isoconcentration maps for PCE and TCE indicate similar UHSU hotspots for the contaminants. Six substantial CCl_4 hotspots appear to be present in the UHSU as shown on the isoconcentration maps. These UHSU hotspots are likely areas where contamination might be present in the underlying LHSU if migration has occurred between the UHSU and LHSU, therefore the Revised Bedrock Work Plan field investigations will be focused in these areas.

Two potential scenarios for migration of groundwater contamination from the UHSU to LHSU have been proposed. Scenario 1 (Figure 1-27) involves lateral migration of contaminants from the UHSU alluvium and/or No. 1 Sandstone to discharge points beneath the colluvium along

the slope of the Woman Creek drainage. The downslope migration of the contaminated water within the colluvium results in localized recharge of the LHSU sandstones that are subcropping beneath the colluvium. Contamination has been found in existing LHSU wells screened in the vicinity of the subcrops. It is expected that LHSU contamination resulting from this scenario will be limited to the vicinity of the subcrops because the lateral hydraulic gradient within the LHSU sandstones should be toward the drainages, thus the contamination should be discharged relatively quickly back into the colluvium. As such, contamination migration is associated with an UHSU exposure pathway through the colluvium, rather than a LHSU exposure pathway.

Scenario 2 (Figure 1-28) involves vertical migration of contamination from the UHSU to LHSU sandstones where LHSU sandstones are in close vertical proximity to the UHSU. Once in the LHSU sandstones, the contaminants potentially migrate laterally within the sandstones or vertically to deeper LHSU sandstone units. As such, contaminant migration for scenario 2 may be associated with a potential LHSU exposure pathway if the sandstones are hydraulically interconnected and laterally continuous. For this scenario, the expected condition is that little or no vertical migration of contamination has occurred from the UHSU to LHSU sandstones. the contamination does not pose a risk to human health because

Of the two scenarios, scenario 2 is of the most concern with regard to the LHSU because it is potentially associated with a LHSU exposure pathway. Scenario 1 is of less concern with regard to a potential LHSU exposure pathway because it is believed to be associated with an UHSU exposure pathway (i.e., migration of contaminants through the colluvium).

Data from existing OU-2 LHSU wells were evaluated to assess identified contamination in the LHSU. Where applicable, the identified contamination was evaluated relative to the LHSU contamination source scenarios discussed above. Based on the available data, chlorinated hydrocarbons (CHCs) such as CCl_4, tetrachloroethene (PCE), and trichloroethene (TCE) have been detected in 10 out of 26 LHSU monitoring wells for which data are available since 1990 (Figure 1-29). Of those 10 wells, seven are located on the north slope of the Woman Creek drainage and are screened in LHSU sandstones near where they subcrop beneath the colluvium. These wells, which have the most consistent and highest concentration detections observed in the LHSU groundwater, are believed to be representative of the scenario 1 mechanism believed to be associated with an UHSU exposure pathway.

The other three LHSU wells with CHC detections are located in the central portion of the OU-2 plateau and may be representative of scenario 2. Such contaminant migration, if it occurs, may be associated with a potential LHSU exposure pathway. However, the evidence for this

is limited. In general, these wells have had concentrations of CHCs in the low parts per billion range, usually near the analytical method detection limits. In many cases, the detected CHCs in these wells have also been detected in laboratory blanks indicating possible laboratory-related contamination of the samples. Based on the available data, it appears unlikely that the contamination identified in these wells is indicative of a LHSU exposure pathway.

The objective of the Revised Bedrock Work Plan is to gather data necessary to sufficiently verify the assumption that contamination in the LHSU has limited extent and, that the LHSU sandstones are discontinuous and of low permeability. The Revised Bedrock Work Plan field program will investigate the most likely areas for LHSU contamination and will evaluate the permeability of LHSU units in those areas. The field program focuses on gathering data to sufficiently determine whether substantial LHSU contamination does not exists, or that, if present, the exposure pathway in the LHSU is incomplete.

The Revised Bedrock Work Plan field investigation activities include drilling and sampling of two bedrock boreholes, drilling and sampling of six bedrock pilot boreholes, and installation of 6 to 12 monitoring wells at six locations (Figure 2-1), collecting and analyzing groundwater samples from each newly-installed LHSU monitoring well, and slug testing of each newly-installed LHSU monitoring well. Three of the six locations for monitoring well installation (WC-1, WC-5, and WC-6) were selected to evaluate the potential for vertical migration of UHSU contamination to LHSU sandstone units (scenario 2). The other three monitoring well locations (WC-2, WC-3, and WC-4) were selected to verify that contaminants detected in LHSU wells along the slope of Woman Creek (scenario 1) are related to localized infiltration of contaminated colluvial water into the subcropping LHSU sandstones. The two borehole locations (SB-1 and SB-2) were selected to investigate the vertical extent of contamination identified previously in LHSU claystones samples.

At locations WC-1, WC-5, and WC-6 the investigation will focus in areas where UHSU contamination has been detected at the highest levels, or where contaminants have been detected previously in the LHSU. The locations, WC-1 and WC-6, were selected because they are within UHSU contamination hotspots (Figure 1-26), and LHSU sandstones are in close vertical proximity to the UHSU. The location, WC-5, was selected because low levels of contamination have been identified in an existing well completed in a LHSU claystone. The expected condition at WC-1, WC-5, and WC-6 is that vertical migration of contamination to LHSU sandstone units from overlying areas of UHSU contamination is minor. This is expected to be evidenced by little or no contamination of LHSU sandstone units at the investigation locations.

To assess whether LHSU contamination is present at locations WC-1, WC-5, and WC-6, a monitoring well will be installed into the uppermost LHSU sandstone unit, or into the LHSU target interval where contamination was detected previously. The wells will be sampled and groundwater analyzed for selected indicator parameters for expedited analysis and for the full suite of LHSU analytical parameters. The results of expedited laboratory analysis of groundwater samples from these wells for a selected indicator parameter suite will quickly indicate the presence or absence of contamination. If contamination is detected, a second monitoring well will be installed to the next deeper sandstone to evaluate the vertical extent of the LHSU contamination. In addition, slug tests will be performed in each new LHSU monitoring well to evaluate the permeability of the LHSU sandstones. The expected condition is that the LHSU sandstone units have low permeability. This is expected to be demonstrated by slug test results that indicate LHSU sandstone units have permeabilities less than 1×10^{-5} cm/s.

WC-2, WC-3, and WC-4 will be installed to evaluate the source of contaminants in LHSU sandstones near where they subcrop beneath colluvium along the Woman Creek drainage (i.e., scenario 1). The new wells will be installed upgradient and away from the LHSU subcrop areas so as to be outside the influence of localized recharge from UHSU colluvial water to the LHSU sandstones, if it is occurring. The location for WC-2 was selected to investigate the source of LHSU contamination identified in the Well 1187. The locations for WC-3 and WC-4 were similarly selected to investigate the sources of LHSU contamination identified in Wells 00391 and 1487, respectively. At locations WC-2, WC-3, and WC-4, groundwater samples will be collected and analyzed on an expedited basis for a selected indicator parameter suite to assess whether or not contamination is present. Samples will also be analyzed for full suites of LHSU parameters. If contamination is not detected, it will be concluded that the contaminants detected in the existing well near the subcrop were introduced to the LHSU sandstone through an UHSU exposure pathway (scenario 1). This is the expected condition. If contaminants are detected, it will be an indication that the contamination migrated vertically to the LHSU sandstone from an UHSU secondary source area and then migrated laterally within the LHSU sandstone to the existing well near the subcrop location. In that case, a second well will be installed into the next deeper LHSU sandstone to evaluate the vertical extent of the contamination in the LHSU. In addition, slug tests will be performed in each new LHSU monitoring well to evaluate the permeability of the LHSU sandstones. Again, the expected condition is that the LHSU sandstone units have low permeability and are discontinuous.

Boreholes, SB-1 and SB-2 (Figure 2-1), will be drilled adjacent to existing Boreholes 09991 and BH2587, respectively, to evaluate the vertical extent of CHC contamination identified in LHSU

claystone bedrock samples previously collected in those areas (Figure 1-30 and 1-31). The new boreholes will be drilled to allow collection of samples from intervals below the depth of the samples collected previously (Figure 2-7). The expected condition is that the identified contamination will be limited in vertical extent to within the depths of SB-1 and SB-2.

Two sets of groundwater samples will be collected from the newly-installed LHSU monitoring wells and analyzed to evaluate groundwater quality in the LHSU. One set will be submitted to an analytical laboratory for analysis on a quick turn-around basis for a suite of indicator parameters (Table 2-6). The second set of samples will be submitted to another analytical laboratory for analysis for a more extensive suite of LHSU analytical parameters (Table 2-8).

The sole purpose of the indicator parameter analyses will be to assess whether or not contamination is present in a LHSU unit at a particular location. Specific factors considered in selecting the indicator parameters include: (1) they should have been detected in on-site waste or as existing groundwater contamination at substantial concentrations; (2) they should be mobile and relatively stable and persistent over the flow path of interest; (3) they should be measurable at low concentrations and should be unambiguous with respect to site-related contamination versus sampling/laboratory artifacts; and (4) they should be readily discernable at low levels from naturally occurring conditions.

The purpose of analyzing a second set of samples for a more extensive suite of LHSU analytical parameters is to verify the results of the indicator parameter analyses, and to fully characterize the types of contaminants, if present, in the LHSU at a particular location. The LHSU parameter analysis suite is a refinement of the full analytical parameter list used for the Alluvial Work Plan. Certain parameters or types of parameters were eliminated for the Revised Bedrock Work Plan LHSU parameter analysis suite because they had not been detected to date in UHSU samples at a frequency greater than five percent, are not believed to be present in on-site waste, are believed to be sampling/laboratory artifacts, or are not present at levels above background.

Bedrock claystone samples collected from Boreholes SB-1 and SB-2 will be analyzed for the parameters listed in Table 2-4. This list is similar to the LHSU parameter analytical suite for groundwater, and is tailored for claystone sample analysis.

It is anticipated that most, if not all, of the analytical results for the indicator parameters and some non-validated results for the LHSU analytical parameters will be included in the contamination assessment portion of the Draft Phase II RFI/RI Report to the EPA and CDH.

All validated analytical results for the LHSU analytical parameters, including Quality Assurance/Quality Control results, are anticipated to be available for inclusion in the Final Phase II RFI/RI Report.

As previously noted, the quantitative assessment of human health risk associated with the UHSU will be conducted concurrently with the Revised Bedrock Work Plan field investigation. It is assumed that the results of the Revised Bedrock Work Plan field investigation will confirm the assumption that the extent of contamination in the LHSU is limited. If the results do not confirm the assumptions, the contingency plan will be implemented.

2.0
SAMPLING AND ANALYSIS PLAN

This section provides a description of the Sampling and Analysis Plan to be implemented for the Revised Bedrock Work Plan field investigation program. The purpose of this section of the technical memorandum is to provide a SAP that will address the data needs and describe the work required to fulfill the data quality objectives discussed in Section 1.0.

2.1 OBJECTIVES AND APPROACH

The goals of the Revised Bedrock Work Plan field investigation program are to: 1) evaluate the presence or absence of contamination in LHSU units, and if present, the source, nature, and vertical extent of contaminants in the LHSU, and 2) estimate the permeability of LHSU units containing contamination to evaluate whether viable migration pathways to human receptors exist. As discussed in Section 1.0, this field investigation program is a refinement of the program previously described in the Bedrock Work Plan (EG&G 1991e).

The Revised Bedrock Work Plan field investigation program focuses on gathering data to sufficiently verify the assumption that substantial LHSU contamination associated with potential LHSU exposure pathways does not exist, or that, if present, the permeability of the LHSU units is insufficient for them to act as a complete exposure pathway. It is believed that this approach is appropriate because, as discussed in Section 1.2, data collected to date indicate that the potential for migration of contaminants from the UHSU to the LHSU, as well as the potential for migration of contaminants within the LHSU, appears to be limited. Additionally, based on the low permeability of LHSU units, it appears that development of an on-site domestic water supply from the LHSU is infeasible. In the event that the results of the field investigation program contradict the assumed conditions, provisions of the contingency plan will be implemented, including additional field investigations, if necessary, to characterize the nature and extent of LHSU contamination, and evaluate the potential for human health risk. may be required. The approach described herein is proposed because it is believed that the potential for human health risk is greatest for the UHSU. This approach will allow completion of the RFI/RI in a timely manner so as to address that potential as expediently as possible.

The Revised Bedrock Work Plan field investigation program is designed to incorporate an observational approach that will allow the results of the field work to be evaluated as each

The Revised Bedrock Work Plan focuses on acquiring data to confirm whether or not substantial LHSU contamination exists, and evaluating whether the permeability of LHSU units is sufficient for them to act as a complete LHSU exposure pathway to human receptors (Figure 1-4). If the results of the Revised Bedrock Work Plan confirm that the nature and extent of contamination in the LHSU is limited and that the permeability of LHSU units is insufficient for them to act as a pathway to human receptors, as indicated by available data, a detailed investigation of the LHSU, as previously proposed in the Bedrock Work Plan, will not be necessary to support an OU-2 RFI/RI Report conclusion that human health risk associated with LHSU exposure pathways is negligible. Alternatively, if the results of the Revised Bedrock Work Plan fail to confirm that the nature and extent of contamination in the LHSU is limited, then additional investigation may be necessary. A contingency plan will be developed for review and approval by EPA and CDH to minimize delays.

The Revised Bedrock Work Plan field investigation program is a focused program designed to incorporate an observational approach that will allow field results to be evaluated as each field component is completed. With this approach, the investigation of the LHSU can be expedited, while reducing the potential for needing additional phases of field investigation. The Revised Bedrock Work Plan will be implemented simultaneously with ongoing alluvial site characterization and risk assessment work in order to complete the Phase II RFI/RI Report in the Spring of 1994, because of the expected condition that contamination in the LHSU is limited in nature and extent. It is expected that the results of the Revised Bedrock Work Plan will support that assumption. If the assumption is valid, no quantitative assessment of human health risk associated with the LHSU will be performed for the Draft Phase II RFI/RI Report. The results of the expedited analysis of indicator parameters for groundwater will be used during the field investigation to evaluate if the expected condition of limited LHSU contamination is met. The results of the expedited indicator parameter analyses, as well as available non-validated analytical results for the LHSU analytical parameters, will be included in the data section of the Draft Phase II RFI/RI Report. The validated results of analyses of the full LHSU suite will not be available for use in the Draft Phase II RFI/RI Report.

If the expected condition is found not to exist, delays in the currently identified schedule for submittal of the Draft and Final Phase II RFI/RI Reports may result. To minimize delays, a contingency plan is being developed so that, if the results of the Revised Bedrock Work Plan do not confirm the assumed site conditions, the plan will this plan can be implemented while the field crews are mobilized. The contingency plan will be reviewed and approved by EPA/CDH.